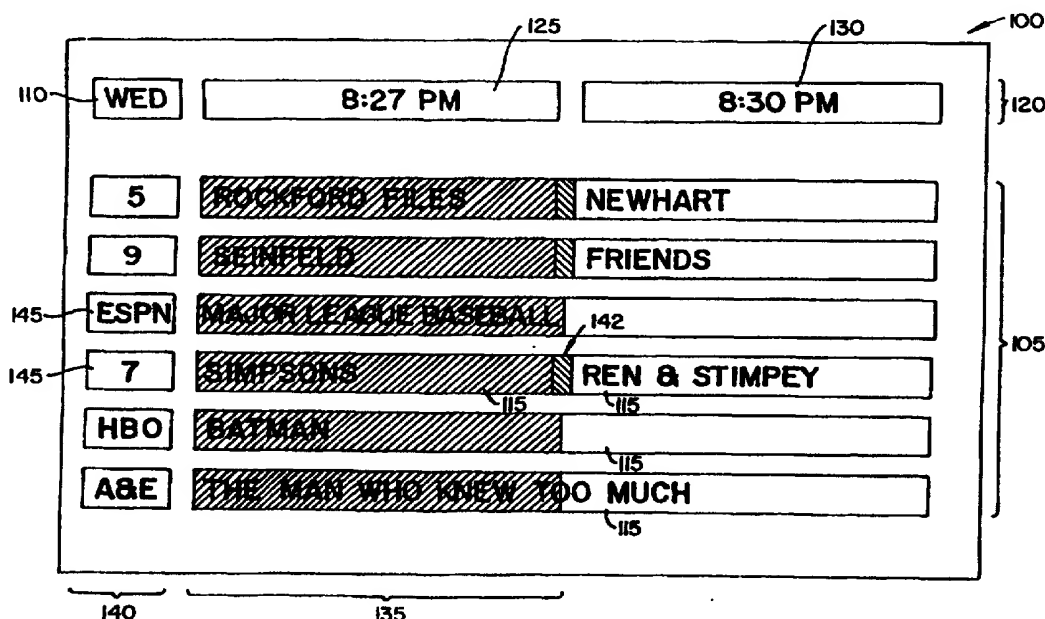




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶: H04N 7/10, 7/14	A1	(11) International Publication Number: WO 98/07277 (43) International Publication Date: 19 February 1998 (19.02.98)
(21) International Application Number: PCT/US97/14359 (22) International Filing Date: 12 August 1997 (12.08.97) (30) Priority Data: 60/023,692 14 August 1996 (14.08.96) US 08/884,376 27 June 1997 (27.06.97) US (71) Applicant: STARSIGHT TELECAST, INC. [US/US]; 39650 Liberty Street, Fremont, CA 94538 (US). (72) Inventors: MILNES, Kenneth, A.; 35815 Hibiscus Court, Fremont, CA 94536 (US). SCHEIN, Steven; 1326 Hoover Street #10, Menlo Park, CA 94025 (US). (74) Agents: KRUEGER, Charles, E. et al.; Townsend and Townsend and Crew LLP, 8th floor, Two Embarcadero Center, San Francisco, CA 94111 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: PROGRAM GUIDE SYSTEM AND METHOD OF OPERATION



(57) Abstract

A system (1) and method for displaying a simplified electronic program schedule guide (100) on a user's television monitor (515) is provided. In one embodiment, the program schedule guide (100) is abbreviated to include only the programs currently available for viewing on a subset of the available channels. In another embodiment, the program guide screen (100) visually distinguishes between programs for the convenience of the viewer.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

5

PROGRAM GUIDE SYSTEM AND METHOD OF OPERATION

CROSS REFERENCE TO RELATED APPLICATION

This application is a nonprovisional application of U.S. provisional patent application "GUIDE SYSTEM AND METHOD OF OPERATION," U.S. Serial Number 60/023,692, filed August 14, 1996, having Kenneth A. Milnes and Steven Schein as the inventors and assigned to StarSight Telecast, Inc.

10

BACKGROUND OF THE INVENTION

The present invention relates generally to a program schedule guide and, more particularly, to a system and process for allowing a television viewer to access on-screen television program listings in an easy and convenient way.

15

The number of television channels available to the user has grown dramatically within the last decade, primarily due to the availability of cable and direct broadcast satellite systems. As the number of programs of potential interest to the viewer has increased, a variety of electronic program guides have been developed to help the viewer select programs of particular interest. For example, commonly assigned U.S. Patent Numbers 4,706,121 and 5,353,121 each describes schedule information processing systems which provide the viewer with a convenient way to select programs based on viewer supplied selection criteria.

20

Although electronic program guides alleviate many of the problems associated with selecting programs of interest from the wealth of available channels, some users prefer lower cost systems.

25

SUMMARY OF THE INVENTION

30

The system and method of the present invention provides a program schedule guide which displays less program information, thereby lowering the program cost. The program information to be displayed is received by a peripheral device which can either be a stand-alone device, such as a set-top box, or integrated into the user's television or VCR.

In a preferred embodiment of the invention, the program guide displays an abbreviated program schedule guide. In this embodiment, instead of allowing the user access to schedule information for every program being broadcast on the user's television system(s), the user has only limited schedule information
5 access. The invention can either be designed to allow the user or the system operator to select the schedule information to be presented in this abbreviated mode.

In one embodiment, if the information is presented in an abbreviated format, the user may elect to pay more and get the full format.

In another embodiment of the invention, the program schedule guide
10 only presents programs that are currently being broadcast and/or programs that are to be broadcast in the next thirty minute time slot.

In another embodiment, the user is able to view the schedule guide in either of two modes. In the first mode the schedule guide is displayed on the entire television screen. In the alternate mode, the schedule guide is displayed as an
15 overlay partially covering the broadcast program on the TV screen. Thus in the alternate mode the user is able to view the schedule guide at the same time as they view the desired program.

In another embodiment of the invention, the program schedule guide and information is visually distinguished by color or font, thus making the guide
20 more user friendly. Programs which are currently being broadcast can be designated a different color or font from programs which are to be broadcast during the next time slot. Programs can also be color coded by type, thus allowing the user to quickly differentiate between dramas, comedies, sports, news, etc. The program currently being viewed by the user and to which the television tuner has
25 been set can also be coded by font or a different color.

The program guide can be easily upgraded to a guide system offering more user features. The upgrade can be purchased either through the system operator or through a local store. In one embodiment of the invention, the user can install the upgrade without requiring technical assistance from the system operator.

30 A further understanding of the nature and advantages of the present invention may be realized by reference to the remaining portions of the specification and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a preferred embodiment of a TV/computer system on which a program schedule guide according to the present invention may be displayed;

5 Fig. 2 is an illustration of a program schedule guide screen according to the present invention;

Fig. 3 is an illustration of an alternate embodiment of the program schedule guide screen which only provides schedule information for programs which are currently available for viewing;

10 Fig. 4 is an illustration of a theme selection screen used in an alternate embodiment of the invention;

Fig. 5 is an illustration of a VCR programming screen in accordance with the present invention; and

15 Fig. 6 is an illustration of a basic system configuration according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides a television (TV) schedule system which displays less program information, thereby lowering the program cost. Fig. 1 illustrates a preferred embodiment of TV/computer system 1 that displays a program schedule guide according to the present invention. As shown, system 1 includes a distribution center 10 and multiple receiving locations. Distribution center 10 compiles data for a data-stream. In a preferred embodiment, this data-stream is broadcast to receiving locations 16, 18, 20, and 22. Several methods are available for broadcasting the data-stream from distribution center 10 to receiving locations 16-22. For example, satellite 15 may broadcast this data-stream within the vertical blanking interval (VBI) of a television channel (e.g., PBS) or a dedicated channel to receiving locations 16, 18, 20, and 22. Alternatively, the data may be broadcast out of band, i.e., using non channel specific mechanisms. In another embodiment, the data-stream is provided to receiving locations 16, 18, 20, and 22 via transmission line 13. Transmission line 13 may be, for example, optical fiber, coax cable, telephone line, or the like.

In yet another embodiment, peripheral devices, which are located within the receiving locations, receive the data-stream from, for example, a local service provider 40. Service provider 40 receives the data-stream from distribution center 10 via line 17, and broadcasts the data-stream to the receiving peripheral devices via satellite 15 (or another satellite), or via lines 19 and 13. The receiving peripheral devices may be televisions 30, televisions 34, VCRs 32, VCRs 36, and/or set-top boxes 38. In still further embodiments, PCTVs may be utilized, or the data-stream may be provided to a personal computer for use with the computer and/or more of the above devices.

In the preferred embodiment, information in the data-stream includes TV schedule information. Software located within the peripheral devices utilize the schedule information provided in the data-stream to generate a schedule guide. The software is stored on a computer-readable storage medium such as a ROM, RAM, disk, or other storage device. If the schedule guide is in a grid format, for example, the available channels may be listed on the "y" axis and various times may be listed on the "x" axis. For more information on how the schedule system displays information, see U.S. Patent No. B1 4,706,121 and U.S. Patent No. 5,151,789. Both these patents, like the present patent application, are assigned to StarSight Telecast, Inc., and are hereby incorporated by reference in their entirety for all purposes.

Fig. 2 is an illustration of a program schedule guide screen according to the present invention. As illustrated, program guide 100 substantially covers the display screen of the user's television monitor. The system may also be designed such that program guide 100 covers a portion of the screen, thus allowing the user to view both program guide 100 and a specific program simultaneously. According to one embodiment, the user may switch between a full screen display and an overlay screen to the current show via, for example, an on screen menu with cursor control. This feature allows a user to see a large scale version of the guide, or to be able to see the guide while also getting a "flavor" for a currently selected show through partial observation of the show. Preferably in this mode, the audio for the show also continues to be played.

A central portion 105 of guide 100 gives program schedule information for various channels. A cell 110 indicates the day of the week for

which the program guide information shown in portion 105 is applicable. Portion 105 is divided into cells 115, the length of each cell representing the duration of the program in question. Next to cell 110 and above cells 115 is a header portion 120. Cells 125 & 130 within portion 120 indicate the program times which correspond to the programs shown in individual cells 115.

In one embodiment of the invention, cells 125 and 130 are the only time cells. Cell 125 shows the current 1/2 hour increment, thus every program cell 115 which falls below cell 125 would represent a program which is currently on. This allows the user to immediately recognize what programs are currently available for viewing. In order to make the currently available programs more readily apparent, a portion 135 of portion 105 which is directly below time cell 125 may be color coded or have some other visually distinguishing characteristic. For example, the program names shown in portion 135 may have a different font or size or background. Thus when program guide 100 appears on the user's television screen, the color coding or other visually distinguishing characteristic allows the user to immediately know which shows are available for viewing, i.e., current programs and future programs may be visually distinguished. Programs may also be visually distinguished according to subject content, language, whether they are re-runs or whether or not the programs are being viewed or recorded or scheduled for recording.

Time cell 130 indicates the next 1/2 hour increment immediately following the time shown in cell 125. Therefore if time cell 125 indicates a time of 8:27 PM as used in Fig. 1, time cell 130 indicates a time of 8:30 PM. All of the programs listed in cells 115 which fall directly below cell 130 are programs which are upcoming in the next 1/2 hour time slot. Therefore the user is able to immediately determine the programs which are about to be broadcast. If desired, program cells 115 falling below time cell 130 may be color coded with a different color from that used to code the programs presently being broadcast or otherwise visually distinguished. Future programs may also be visually distinguished according to subject content, language, whether they are re-runs or whether or not the programs are being viewed or recorded or scheduled for recording. Furthermore, by noting whether or not there is a cell division 142 lying directly

below the division between time cells 125 and 130, the user is able to determine whether or not the show in question is beginning or already in play.

In one embodiment of the invention, it is not possible for the user to manipulate the program guide in order to obtain schedule information for programs beginning at a time after that indicated in cell 130.

Portion 140 of guide 100 contains cells 145. Each cell 145 indicates the channel number corresponding to the program guide cell 115 lying immediately adjacent to it in the program guide. Instead of, or in combination with the channel number, cells 145 may contain the program service name. For example, a cell 145 may contain the channel number 8, the service name HBO, or both.

In another embodiment of the invention, not all of the channels which are available on the user's television system are represented within program guide 100. The channels which are to be represented in the guide can either be selected by the user or by the system operator, depending upon how the system is configured. If the user designates the channels to be represented, channels which are seldom viewed can be "discarded", thus allowing the user to more efficiently review the program guide information. If the system operator designates the channels to be represented, then both time and cost savings may be realized since the system may provide less information.

The system operator can use a variety of criteria to determine which channels are to be represented. For example, only the most popular channels may be represented. The system operator may also charge each broadcaster an additional fee to be listed on this particular guide. The system operator may also charge an additional fee, per time slot, to make a specific program "special". A number of different schemes can be used to draw the user's attention to special programs. For example, the program may be listed first in the program guide, shown in a different typeface, presented in a different color, or given additional space for a program description.

In the preferred embodiment of the invention illustrated in Fig. 3, a program guide 200 only provides program schedule information for a single time period, that period representing programs which are presently available for viewing. A cell 205 indicates the time period for which program schedule information is provided. Cell 205 changes every half hour. The programs available for viewing

during the designated time period are listed in a plurality of cells 210. Cells 215 indicate the channel number or service name for the corresponding cells 210. In this embodiment the program schedule information is preferably updated approximately 3 minutes before the half hour. Therefore if the time of day is 7:55 PM when the user requests program guide information, the program guide would provide information for the time period beginning at 7:30 PM. However, if the user waits until 7:58 PM to make the same request, the information provided by the system will be for programs starting at 8:00 PM. The system can be further configured to indicate to the user whether or not a program is continued from a previous time period and/or whether or not the program will be continued after the present half hour time increment. These aspects of the invention can be implemented by either color coding the particular cell in question or through the use of some other form of marking or notation.

Fig. 4 is an illustration of a screen which may appear before program guide screen 100 or 200 in an alternate embodiment of the invention. Screen 300 appears on the user's television monitor when the user selects the program guide feature. The user is prompted to select a theme from a list of very broad categories shown in a portion 305 of screen 300. The subsequent program guide screen then supplies the user with all of the programs fitting the theme requirement for the times provided in the guide.

Fig. 5 is an illustration of a VCR programming screen 400 that may be used in combination with any of the previously described program guides. Screen 400 is divided into a seven day grid. The day of the week is indicated in cell 405. Adjacent to each day of the week is a linear grid 410 which divides each 24 hour day into 48 half hour increments. Due to the limited resolution of a standard television screen, grid 410 can be divided into several segments (e.g., 6, 8, or 12 hour segments), and the user may page through the grid to find the desired time slot. Grid 410 can also be limited to 12 hours, with the screen also having cells 415, which the user may use to indicate AM or PM.

In this embodiment the user first indicates the desire to program the VCR. Typically the initial program guide screen contains an icon labeled VCR. When the user selects this icon, screen 400 pops up. The user then selects the times over which recording is desired, for example by moving the cursor to the

desired time slot and pressing ENTER. Thus if the user wishes to record a program on Thursday night starting at 9:00 PM and ending at 9:30 PM, the user simply moves the cursor to the 9:00 PM slot for Thursday night and presses enter. In the preferred embodiment, if the user wishes to record a program which lasts
5 longer than 30 minutes, the user merely moves the cursor to each successive time slot and presses enter. After the user indicates a specific day and time period through the use of a cursor, the program guide requests that the user enter a channel number. Preferably screen 400 begins flashing a question mark (i.e., "?") in a cell 420 adjacent to the day of the week on which recording has been requested. Screen
10 400 can also request that the user indicate the channel using a message shown in a message portion 425 of screen 400.

After the user has indicated the time and channel for recording, the screen notifies the user with a message in portion 425 that the programming has been successfully completed. In addition, the message in portion 425 may also ask
15 whether the user wishes to set the VCR for recording of another event. If the user has made a programming error, for example, by attempting to record multiple programs at the same time and day, a message in portion 425 notifies the user that the programming was not successfully completed.

Fig. 6 illustrates the hardware elements of a preferred embodiment of
20 the invention. As shown, the configuration utilizes a program guide controller 505 (for example, a data processor), one or more televisions sources 510, and a TV, PCTV or computer monitor 515. The system may also include a VCR 520 and a remote control 525. Program guide system 505 may be a stand-alone device or incorporated into another system such as a television, a cable decoder, computer,
25 PCTV, or a VCR.

The preferred embodiment of the present invention includes a plug-in program guide controller module 530. Module 530 determines the extent of program guide 505's capabilities. Thus module 530 may only allow program guide 505 to present an abbreviated program schedule to the user, the abbreviated
30 schedule showing a limited selection of channels covering a limited time span. For example, in this mode the program guide may contain no more than 20 channels, only showing what is currently on as well as what is to be broadcast during the next half hour increment for each of the selected channels. When the user wishes to

upgrade program guide 505, for example, adding a 7 day program guide for all channels as well as detailed category searching, module 530 may be simply replaced with a different module authorizing more extensive guide capabilities. This embodiment has the distinct advantage of allowing the system to be significantly altered without requiring major hardware changes. For example, module 530 may be upgradeable by the user, thus not requiring the system operator to provide technical support. In this scenario the user would merely procure a different module 530, install the new module into the program guide system 505, and pay the new fee set by the system operator for the new benefits.

Preferably the system operates under the control of software 531 on a removable computer memory. The memory for software 531 may be located in one or more ICs, for example, the plug-in module of the data processor, or in ROM, RAM, or a combination of the two. Accordingly, the disclosures and descriptions herein are intended to be illustrative, but not limiting, of the scope of the invention which is set forth in the following claims.

WHAT IS CLAIMED IS:

- 1 1. A method of operating a guide system comprising:
2 storing data representative of a plurality of media shows in a
3 computer readable memory;
4 inputting a user selection for selectively controlling whether a guide
5 is displayed over substantially all of a screen or partially overlaid over a current
6 television show to which a television receiver is tuned; and
7 selectively displaying a media guide based on said stored data over
8 substantially all of said screen or as an overlay to a current television show based
9 on said user selection.
- 1 2. The method of claim 1 further comprising the step of selecting
2 one of said plurality of media shows, said selecting step performed by a user of said
3 guide system.
- 1 3. The method of claim 1 wherein said media shows are
2 television shows.
- 1 4. The method of claim 3 further comprising the step of selecting
2 a portion of said plurality of television shows, said selecting step performed by a
3 system operator of said television schedule system based on a selection criteria input
4 by a user.
- 1 5. The method of claim 4 wherein said selection criteria is
2 television show popularity.
- 1 6. The method of claim 3 wherein said plurality of television
2 shows are television shows presently available for viewing.
- 1 7. The method of claim 3 wherein said plurality of channels is
2 less than a total number of channels over which programs are received by said
3 television system.

1 8. The method of claim 7 wherein said media guide schedule
2 information is available for a predetermined period of time prior to availability of a
3 program.

1 9. The method of claim 8 wherein said predetermined period of
2 time is approximately 3 minutes.

1 10. The method of claim 3 further comprising the step of visually
2 distinguishing current television shows from future television shows.

1 11. The method of claim 3 further comprising the step of visually
2 distinguishing television shows according to their subject matter.

1 12. The method of claim 3 wherein information displayed within
2 said media guide may not be manipulated by a user.

1 13. A computer program product comprising:
2 computer readable code that inputs media program schedule
3 information, said schedule information comprising at least program information and
4 times;
5 computer readable code that selectively displays said media program
6 schedule information over substantially all of a screen or partially overlaid over a
7 current television show to which a television receiver is tuned; and
8 tangible media that store the computer readable code.

1 14. The computer program product as recited in claim 13 wherein
2 said media shows are television shows.

1 15. The computer program product as recited in claim 13 wherein
2 said media program schedule information is updated every half hour a few minutes
3 before the half hour.

1 16. The computer program product as recited in claim 13 wherein
2 said media program schedule information has the current program visually
3 distinguished.

1 17. A method of generating a media guide in a user display
2 comprising:
3 providing guide information for a plurality of channels to a user; and
4 when said user activates an optional guide service, providing said
5 user guide with additional guide information.

1 18. The method recited in claim 17 wherein said optimal service is
2 provided through acquisition and use of a plug-in module.

1 19. The method of claim 17 further comprising the step of
2 selecting said plurality of channels, said selecting step performed by a user.

1 20. The method of claim 17 further comprising the step of
2 selecting said plurality of channels, said selecting step performed by a system
3 operator based on a selection criteria.

1 21. The method of claim 20 wherein said selection criteria is
2 channel popularity.

1 22. The method of claim 17 wherein said plurality of channels are
2 channels presently available for viewing.

1 23. The method of claim 22 wherein said guide information for
2 programs are available for a predetermined period of time prior to said availability
3 of said programs on said plurality of channels.

1 24. The method of claim 23 wherein said predetermined period of
2 time is approximately 3 minutes.

1 25. A method of displaying media guide information comprising:
2 displaying a plurality of current playing and future playing media
3 guide listings; and
4 visually distinguishing those listings that are currently playing from
5 future play listings with at least one visually distinguishing feature.

1 26. The method of claim 25 further comprising the step of
2 selecting said first plurality of media guide listings, said selecting step performed by
3 a user.

1 27. The method of claim 25 further comprising the step of
2 selecting said first plurality of media guide listings, said selecting step performed by
3 a system operator based on a selection criteria.

1 28. The method of claim 27 wherein said selection criteria is
2 television guide listing popularity.

1 29. A media schedule system for displaying VCR programming
2 guide information, said system comprising:
3 a data processor;
4 a switching mechanism coupled to said data processor for activating
5 and suspending operation of said VCR programming guide information system; and
6 a display generator coupled to said data processor for generating a
7 display containing said VCR programming guide information, wherein said display
8 contains a grid of time segments and channel numbers of which a plurality of times
9 and/or channels can be selected can be chosen for programming a VCR.

1 30. The media schedule system of claim 29 wherein a user may
2 choose a channel number by entering the channel number.

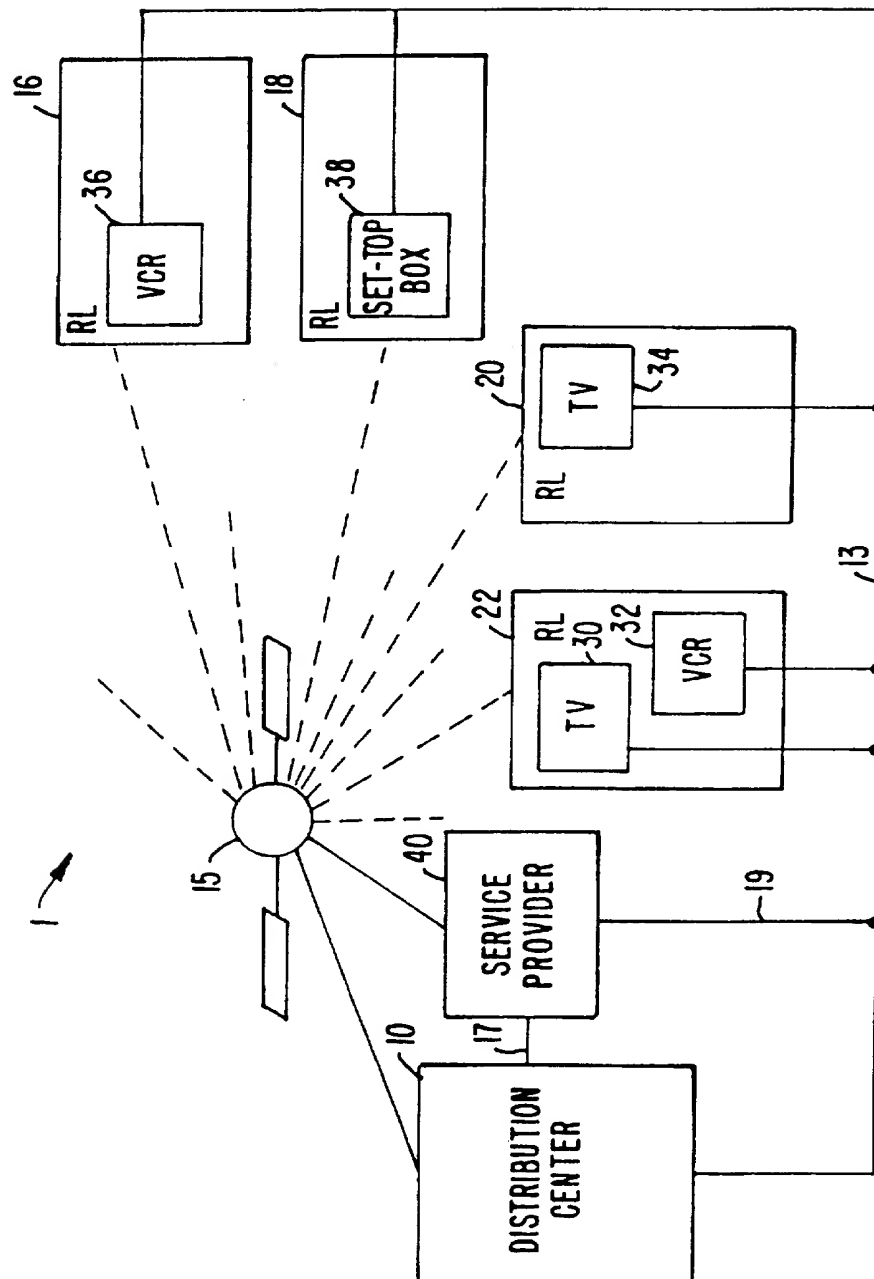


FIG. 1.

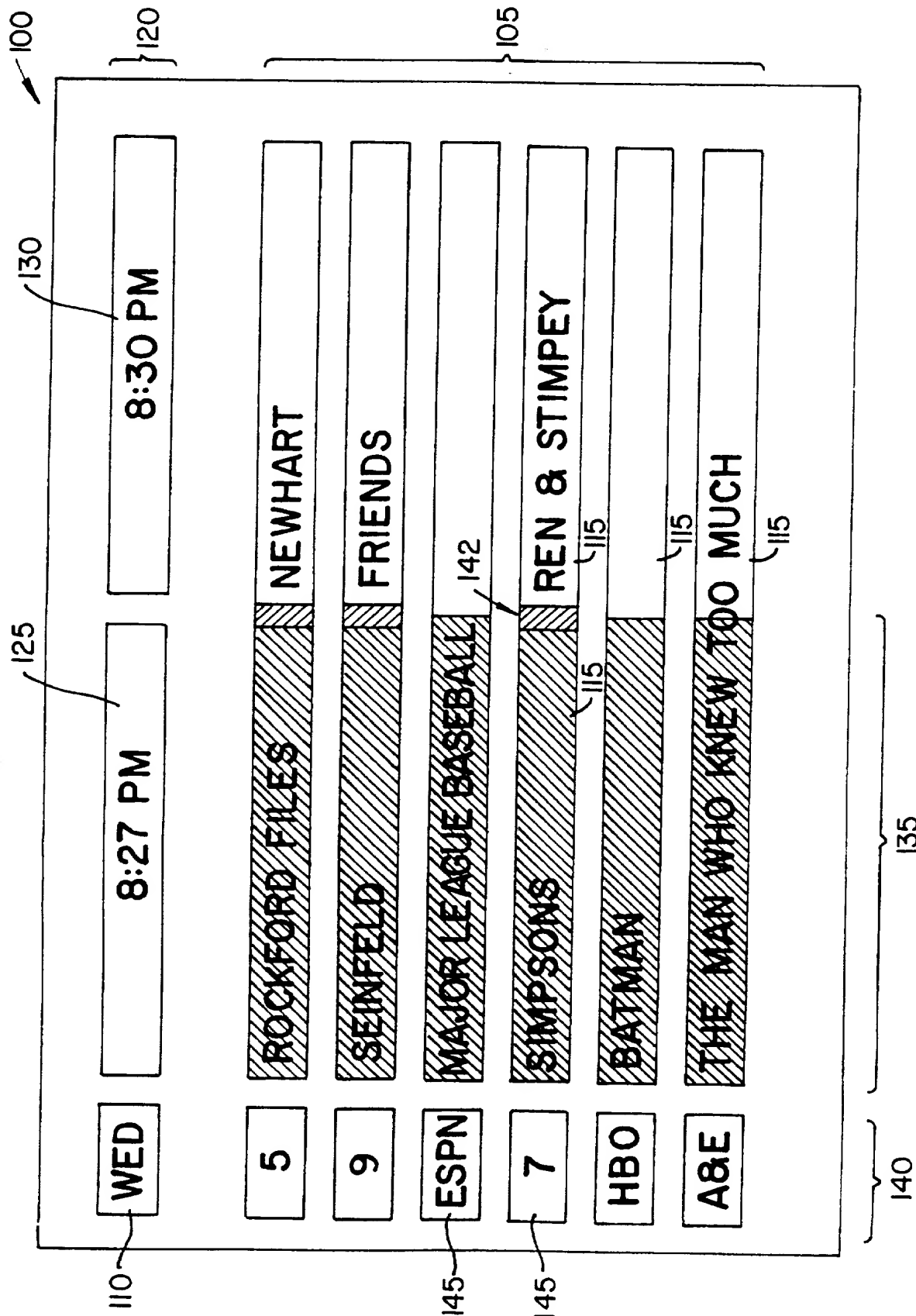


FIG. 2.

3/6

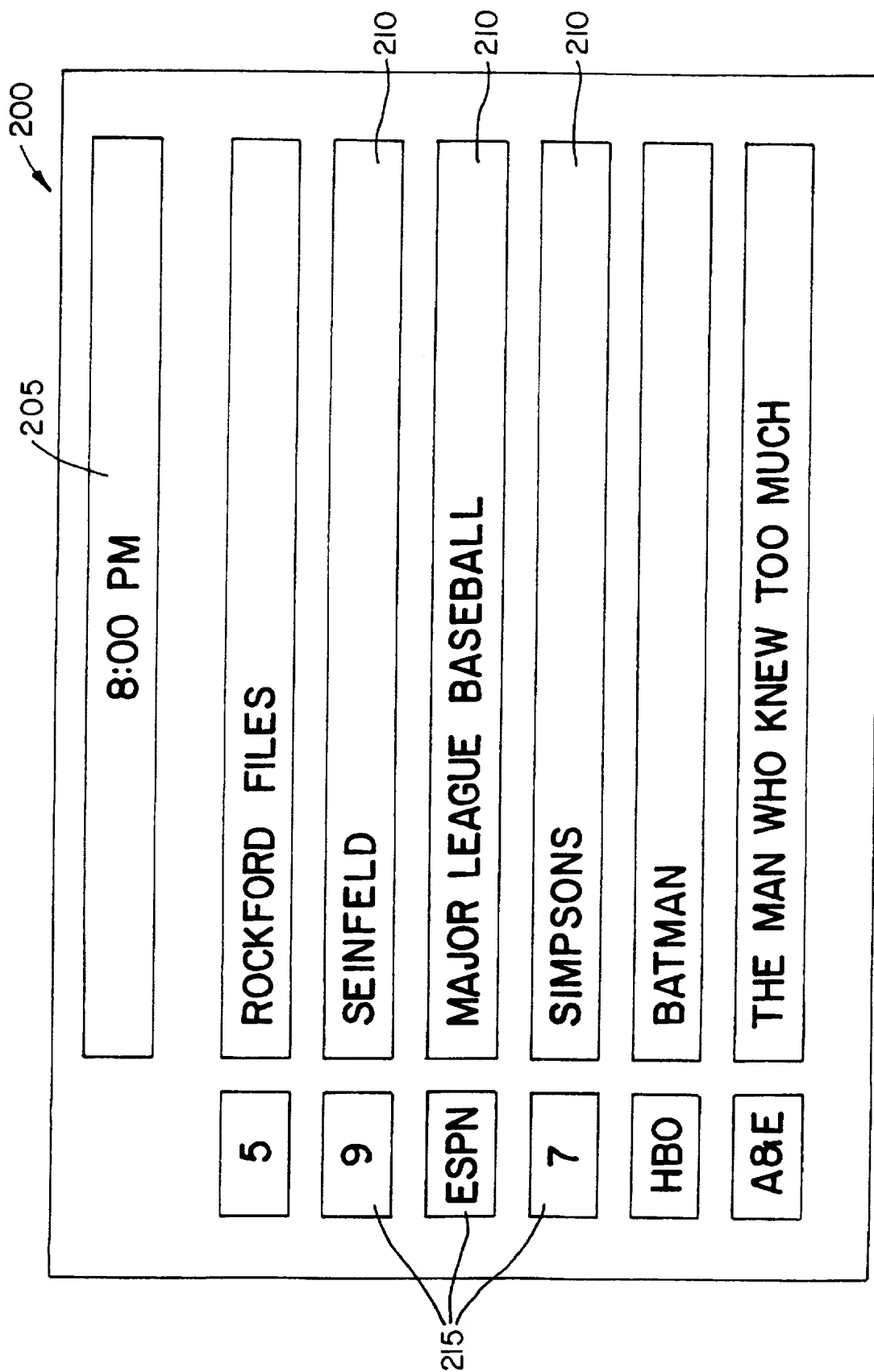


FIG. 3.

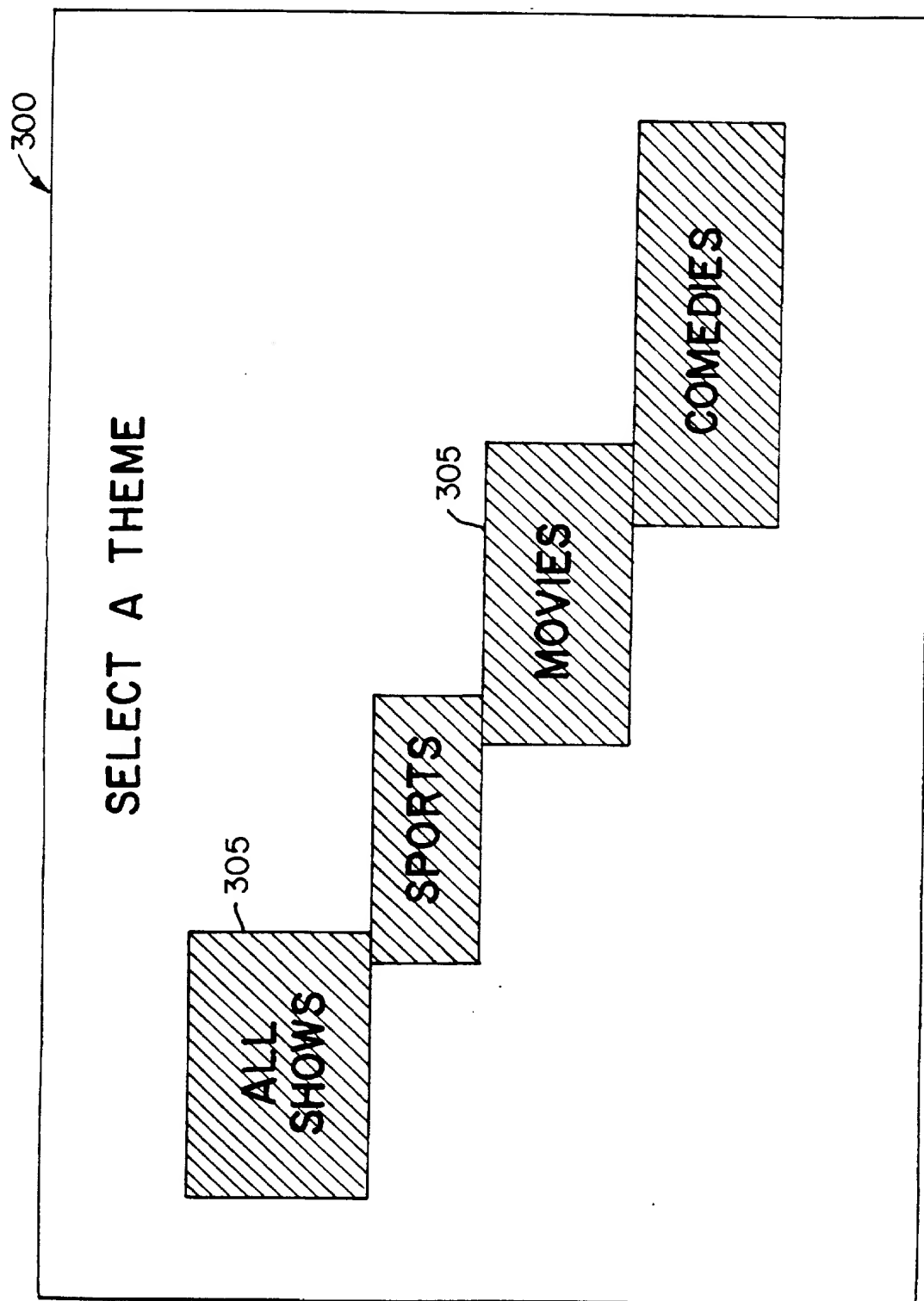
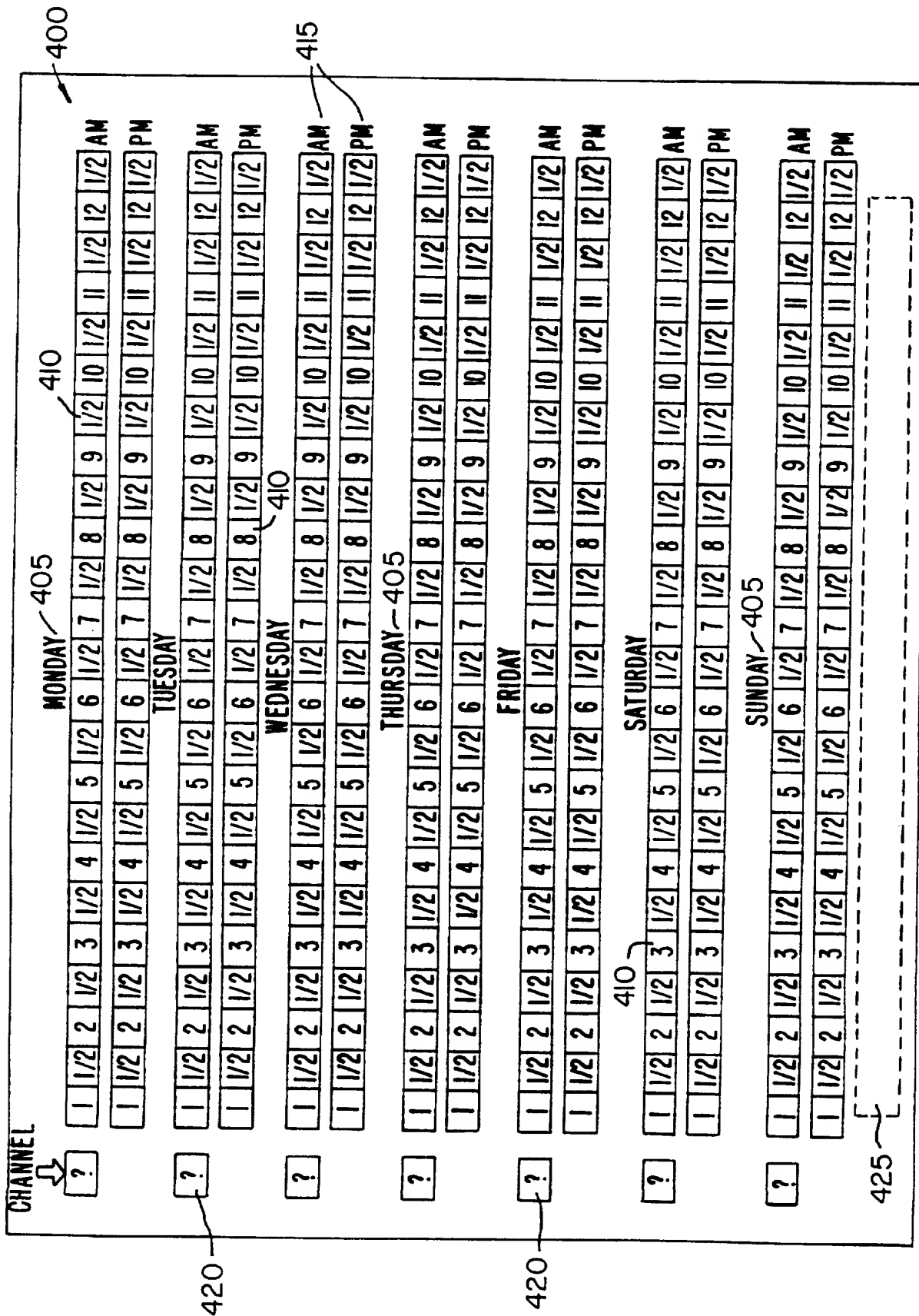


FIG. 4.



6/6

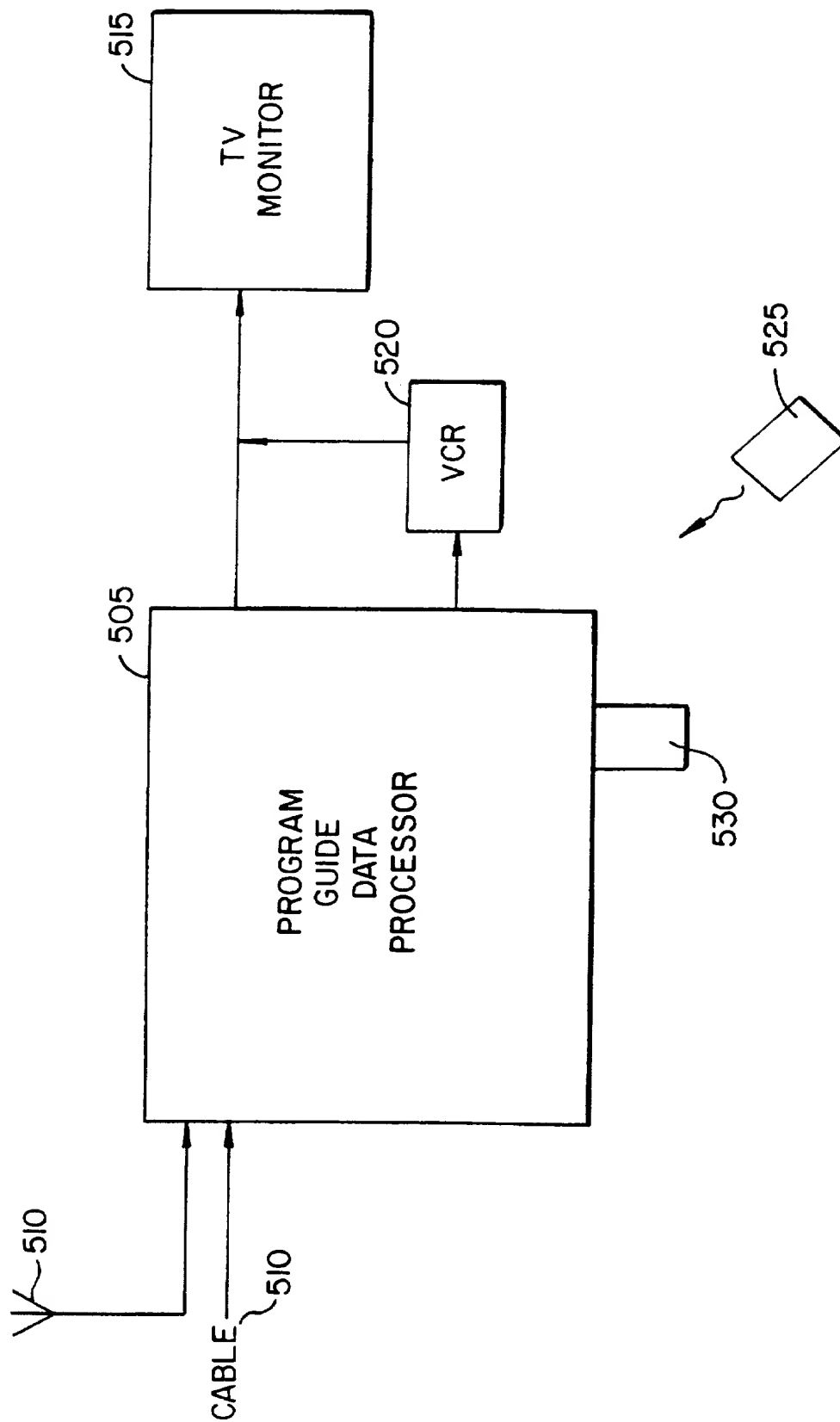


FIG. 6.

INTERNATIONAL SEARCH REPORT

 International application No.
 PCT/US97/14359

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : HO4N 07/10, 07/14

US CL : 348/563, 906, 7

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/563, 906, 7, 6, 10, 12, 13, 565; 455/5.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

search terms: program guide, schedule, update###, refresh###, hour?, minute?

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95/01057 A (FLORIN et al) 05 January 1995, page 6, line 1- page 7, line 8, page 25-page 56, and fig. 2, 12-16.	17-30
---		---
Y		1-16
Y	US 5,357,276 A (BANKER et al) 18 October 1994, col. 6, lines 3- 25.	1-16
Y	US 4,199,781 A (DOUMIT) 22 April 1980, col. 5, line 68 - col. 6, line 13.	15
A	US 5,436,676 A (PINT et al) 25 July 1995, fig. 3 .	1-30
A	US 5,585,838 A (LAWLER et al) 17 December 1996, entire document	1-30

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	*T* Inter document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
B earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

30 OCTOBER 1997

Date of mailing of the international search report

29 DEC 1997

 Name and mailing address of the ISA/US
 Commissioner of Patents and Trademarks
 Box PCT
 Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer


 LINUS H. LO

Telephone No. (703) 305-4039

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/14359

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,606,374 A (BERTRAM) 25 February 1997, entire document.	1-30